SPC-8
general purpose
computer

High performance and low cost • Maintainability breakthrough • Programming simplicity • II Hardware registers • Random access core memory • 2 usec memory cycle • 46 basic instructions • Teletypewriter interface standard • Wirefree construction • One-piece packaging, including power and cooling • Conversational software • Real-time control option • Real-time instruction set option • Direct memory transfer option • System interface units • Peripheral controller units • Application software services • System engineering services

GENERAL AUTOMATION, INC. *Automation Products Division*

SPC-8
Full scale computer power at new, low cost

The SPC-8 is a computer specifically designed for the application of computer essentials and technology to current and new data processing, handling, and control projects. A full-scale general-purpose computer, it can execute programs in excess of 230,000 instructions per second, and can input or output data at a rate of 460,000 bytes per second.

The SPC-8 includes an 8-bit by 4,096 byte memory (expandable to 8,192 bytes) with a full cycle time of 2 microseconds. The computer includes a parallel adder, four addressing modes, six 12-bit registers, two accumulators, a hardware index register, 46 basic commands, a priority interrupt system, and a teletypewriter interface.

With its small size, big power, and great versatility, the SPC-8 can be used to: place stored intelligence into industrial machines; collect and process data in hospitals and medical laboratories; concentrate, store, forward, switch and separate data in communication systems; receive and generate data in display systems; count and control traffic; automate production testing and processes; and scan, log, and alarm data in process control.

SPC-8
Easy to use…easy to program

The SPC-8's 12-bit processor organization overcomes the addressing complexity and handicap of small-word-length computers. The organization permits direct and indexed addressing to any location in the 4,096 word memory.

In addition to direct addressing from the low order 12-bit address field, and indexing via the hardware index register, the SPC-8 also features literal addressing and extended memory addressing.
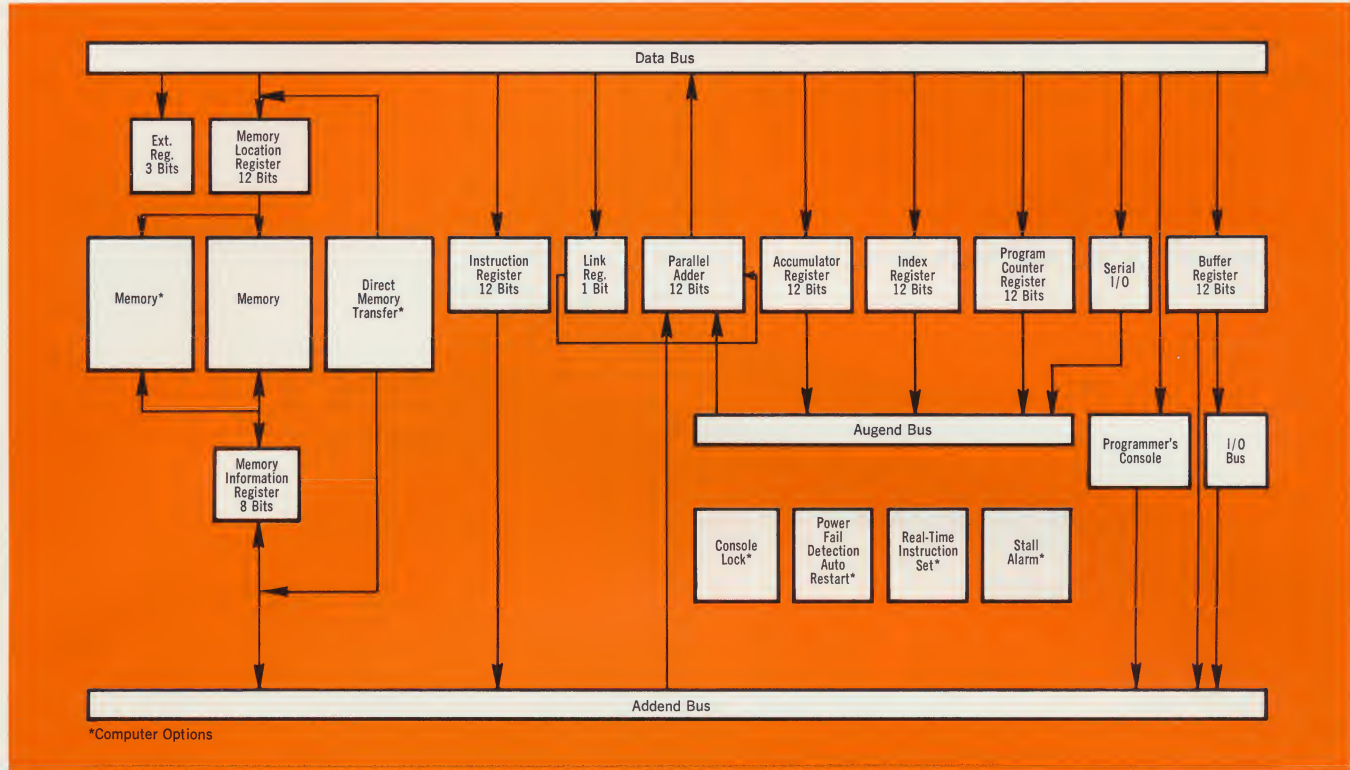
SPC-8 instructions are in five classes:

	7 6 5 4 3 2 1 0			7 6 5 4 3 2 1 0	
Load B, Store B, Jump	Operation Code	X	Address	Address	
Skip	Operation Code	Condition	N		
Arithmetic, Logical	Operation Code			Operator	B,Lit	Register
Register Transfer	Operation Code			Mode	Register D	Register S
Control, Shift, I/O	Operation Code			Mode	Shift, Control	Register,I/O

X = Indexed addressing.
N = 0, 2, 4, or 6
D = Destination
S = Source

SPC-8
Organization

The SPC-8 is organized to process data efficiently and easily. A dual-purposed computer, it has a 12-bit organization and a common bus structure. The 12-bit registers provide a simple and efficient means to randomly address all programs and data in memory. This organization also provides for effective processing of byte oriented data.

*Computer Options

SPC-8
Instruction repertoire

Mnemonic	Description	Cycles
Load B, Store B, Jump Class		
LDB m	Load B register	3
LDB m,X	Load B register, indexed	3
STB m	Store B register	3
STB m,X	Store B register, indexed	3
ELB m	Extend Load B register	4
JMP m	Jump to m	2
Skip Class		
SKS N	Skip on Link Set	1
SKR N	Skip on Link Reset	1
SKP N	Skip on Plus	1
SKM N	Skip on Minus	1
SKZ N	Skip on Zero	1
SKN N	Skip on Not Zero	1
SKF N	Skip on I/O False	1
SKT N	Skip on I/O True	1

Mnemonic	Description	Cycles
Arithmetic, Logical Class		
AAD r,B	Add B to r	2
AAD r,v	Add v to r	3
ASU r,B	Subtract B from r	2
ASU r,v	Subtract v from r	3
ALD r,v	Load v into r	3
AZE r	Zero r	2
AND r,B	Logical AND B with r	2
AND r,v	Logical AND v with r	3
AOR r,B	Logical OR B with r	2
AOR r,v	Logical OR v with r	3
AXR r,B	Logical Exclusive OR B with r	2
AXR r,v	Logical Exclusive OR v with r	3
Register Transfer Class		
RTR r,r	Transfer r to r	2
RIC r,r	Transfer & Increment, r to r	2
RDC r,r	Transfer & Decrement, r to r	2
RLK r,r	Transfer & Add Link, r to r	2

Mnemonic	Description	Cycles
Control, Shift, I/O Class		
PLR	Pulse Link Reset	2
PLS	Pulse Link Set	2
TBB	Transfer BB to B	2
TBE	Transfer B to E register	2
SHR r	Shift Right r	2
SHC r	Shift Circular r	2
SHL r	Shift Circular Link r	2
SHI r	Shift Serial in r	2
SHRO r	Shift Right & Serial Out r	2
SHCO r	Shift Circular & Serial Out r	2
SHLO r	Shift Circular Link & Serial Out r	2
SHIO r	Shift Serial in & Out r	2
FOB	Function Out from B register	2
DOB	Data Out from B register	2
DIB	Data in to B register	2
TOI	Transfer on Interrupt	3

m= memory location
v= literal value
r= selected register

The SPC-8 provides both parallel and serial I/O systems, each operating independently of the other. Included is a priority interrupt system to permit asynchronous events to interrupt the normal sequencing of a program to demand service.

The parallel I/O system provides flexibility through a single set of data and control lines to interface readily to a wide variety of external equipments. The 12-bit data bus of the I/O permits efficient handling of 8, 12, 16, and 24 bit data transfers.

The data transfer channel of the serial I/O system permits the transfer of serial data under program control. The serial I/O bus is typically connected to a teletypewriter, which can be operated up to 2000 feet away.

The SPC-8 need not be modified when adding new peripherals or interfaces, and expansion can be achieved in the field. Devices are connected by simply wiring the I/O bus from one device to the next, and the I/O bus drive current is adequate to implement a large number of peripheral interfaces.

SPC-8
Software

All SPC-8 standard software has been designed to provide easy and economical generation of application programs by the user. The standard software package includes a symbolic conversational assembly, an on-line debugging system, a multi-precision arithmetic library, and a maintenance and verification subsystem.

The conversational assembly system is a one-pass symbolic assembly which enables the programmer to recover from errors on-line without having to restart the assembly process. It operates with a teletypewriter unit, and source programs may be entered from the keyboard or from prepared paper tapes.

The basic utility system enables the programmer to trace through his program so that he may correct errors as he goes along, and in general perfect his object program.

In addition to the standard software, total solutions or assistance in software applications are available to SPC-8 users from the programming/engineering staff of Automation Sciences, a Division of General Automation, Inc.
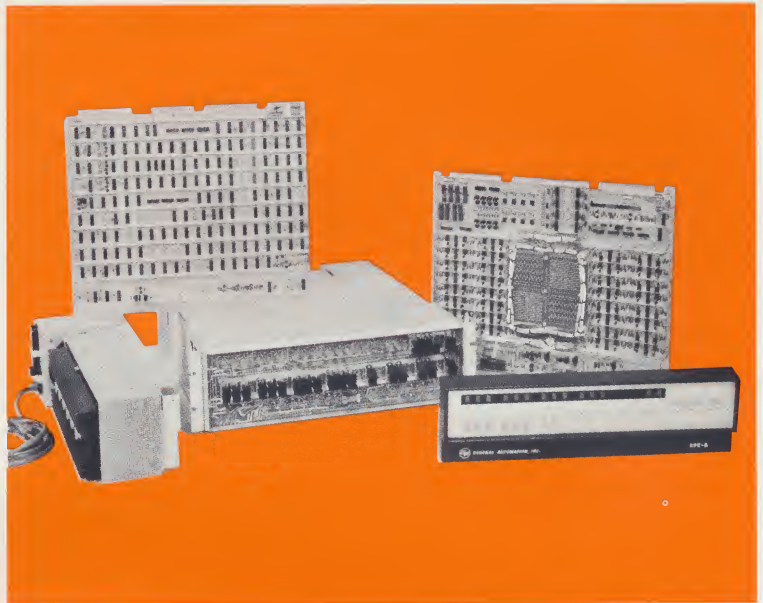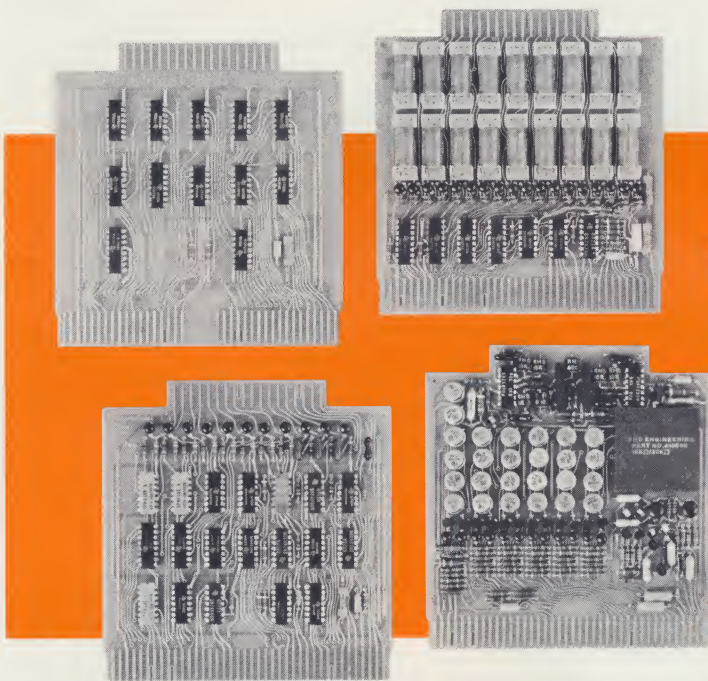
SPC-8
Reliability and Maintainability

SPC-8 computers are designed and manufactured to operate unattended around the clock with the highest level of reliability. Reliability design features include: no-wire construction; integrated circuits; exceptionally wide timing, power, and noise margins; minimal number of components; and worst-case design. In addition, 100% pre-assembly testing is performed on all components and subsystems, and every assembled SPC-8 undergoes operation in an environmental test chamber and burn-in before shipment.

No computer maintenance training is required to service the SPC-8. The computer contains only three types of printed circuit boards—master interconnect, memory, and processor—any one of which can be replaced in less than five minutes. The proper operation of each board can be verified by running the test and verify program.


SPC-8
System interface units

Interfacing the SPC-8 with other system equipment is made exceptionally easy with its full line of compatible plug-in system interface units. Unlike conventional logic modules, which must be combined to perform interface functions, system interface units each contain all circuitry required for the function on a single board. They also reduce the cost of implementing a typical system interface by up to 30%, compared with using logic modules.
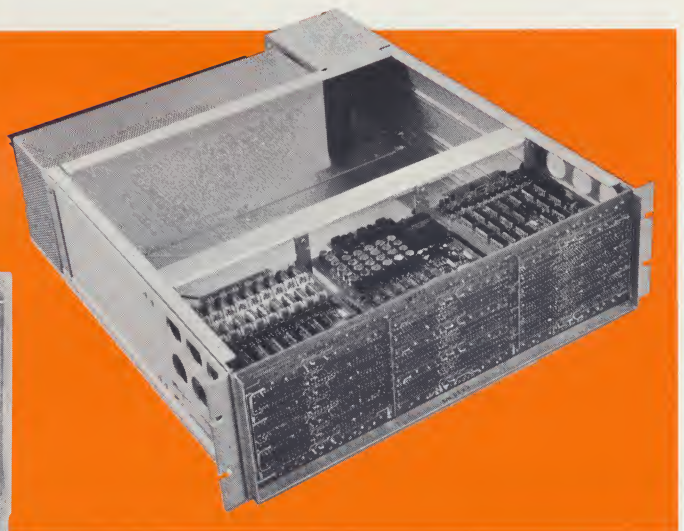
More than 30 such interface units are available, including analog multiplexers, analog-to-digital and digital-to-analog converters, output analog storage units, relay inputs, electronic inputs, relay outputs, electronic outputs, controllers for teletypewriters, data sets, line printers, card readers, paper tape I/O, magnetic tape units, disc memories, and other computer peripherals.

Peripherals and Options

The SPC-8's complement of generalized peripheral controllers enable the computer to interface with many types of peripheral computer equipment, such as magnetic tape, disc memories, line printers, data sets, paper tape equipment, displays, machines, instruments, sensors, and devices.

A choice of processor options can expand the power and utility of the SPC-8 to optimize the computer for a wide variety of system requirements, including a real-time instruction set, direct memory transfer, additional 4,096 word memory, console lock, stall alarm, power fail detection and auto restart.

General Automation Technology

The SPC-8 is another General Automation, Inc. total product line. This complete line comprises the computer, computer options, system interface units, peripheral controllers, peripherals, programming aids, and automation technology services. Automation technology services include application analysis, applied programming, development engineering, systems engineering, and installation service. Any combination of these products and services can be selected and applied to accomplish a complete computer based automation project.

SPC-8 SPECIFICATIONS

COMPUTER TYPE
Digital, single address, parallel processor.

MEMORY
Random access, ferrite magnetic core memory storage; 4,096 8-bit words (expandable to 8,192 words within same enclosure); memory cycle time of 2.16 μsec.

ADDRESSING
Four modes: direct addressing to 4,096 bytes; literal addressing; indexing; extended addressing.

ARITHMETIC
Parallel, binary, fixed point, twos complement.

INSTRUCTIONS
Single and double-word instructions; 46 basic instructions within five classes: Load B, Store B, Jump; Skip N; Arithmetic, Logical; Register Transfer; Control, Shift, I/O.

SPEED
Sample execution times:

Add/subtract registers	4.32 μsec.
Load/store from/to memory	6.48 μsec.
Add/subtract memory	6.48 μsec.
Input I/O bus to B register	4.32 μsec
Output B register to I/O bus	4.32 μsec

INPUT/OUTPUT
12-bit parallel data or control; priority interrupt system; teletypewriter interface.

PANEL
Programmer's console; 12 data switches and indicators; register selection switches; memory guard switch; six control switches.

SOFTWARE
Software package includes conversational assembly system, basic utility system, hardware test and verify programs, and subroutine library.

OPTIONS
Real-time control group; real-time instruction set; power failure detection and automatic restart; stall alarm; expansion to 8,192-word memory; direct memory transfer channel; priority interrupt expander unit; more than 30 system interface units; mounting hardware; 24 volt dc power; teletypewriter; peripheral equipment; programming and engineering services.

DIMENSIONS, Including Power Supply
Height 5-1/4 in., width 17-3/5 in., depth 20 in.

WEIGHT, Including Power Supply
29 lb.

TEMPERATURE, Operable
10°C to 40°C.

HUMIDITY, Operable
90% relative.

POWER
115 v ac ±10%, single phase, 47 to 63 Hz; optional 24 vdc; regulated power supplies included.

INSTALLATION
One-piece packaging includes enclosure, computer, power supply and cooling, permitting table top or standard 19-in. rack mounting.

GENERAL AUTOMATION, INC.
Automation Products Division
706 West Katella, Orange, Calif. (714) 633-1091   TWX 910-593-1601

SALES AND SERVICE OFFICES

General Automation, Inc. has direct sales and service personnel covering the continental United States. Each office is established to provide fast and local service. Computers, spare parts, and manuals are stocked at these locations for your convenience. Watch for new offices to be opened soon in Cleveland, New York, Detroit, and Philadelphia.

VIRGINIA, MARYLAND & WASHINGTON, D.C.
11215 Oakleaf Drive, Suite 110
Silver Spring, Maryland 20901
(301) 593-5509

MIDWEST
649 North Milwaukee Avenue
Wheeling, Illinois 60090
(312) 537-3500

NORTHWEST
4600 El Camino Real, Suite 204
Los Altos, California 94022
(415) 941-5966

NEW ENGLAND & NEW YORK
235 Bear Hill Road, Suite 103
Waltham, Massachusetts 02154
(617) 899-6170

DALLAS
Braniff Tower
Exchange Park, Suite 311
Dallas, Texas 75235
(214) 358-0271

ALABAMA, GEORGIA & SOUTH CAROLINA
3814 Buford Highway, N.E., Suite E2
Atlanta, Georgia 30329
(404) 631-0119

FLORIDA
P. O. Box 8457
Fort Lauderdale, Florida 33310
(305) 587-6063

WESTERN STATES
706 West Katella Avenue
Orange, California 92667
(714) 633-1091   TWX: 910-593-1601

FACTORY
808 North Batavia
Orange, California 92667
(714) 538-1181